

Our Planet

Past and Future: Applications for Paleoclimate Research

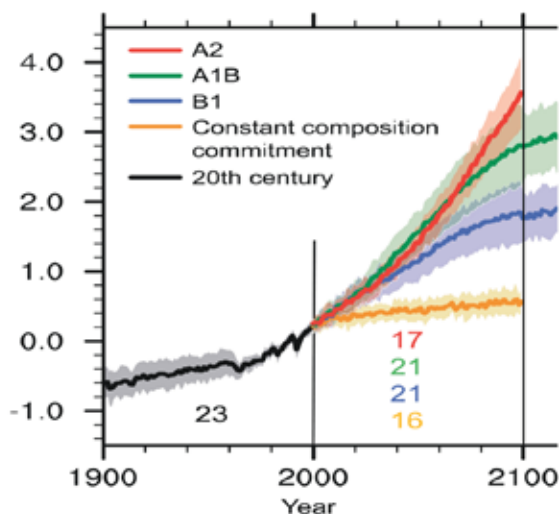
Understanding global climate change—the drivers, impacts, and processes—is the environmental issue of the century. Policy challenges associated with climate, air pollution, ecosystems, and public health demand increasingly sophisticated tools that modeling groups at NASA are working to provide.

Future projections of climate change require large-scale, complex models—but such forecasts can be difficult to verify. Scientists at the NASA Goddard Institute for Space Studies (GISS) at Goddard Space Flight Center are illustrating the use of past climate data to test the models in situations that are very different from today's climate conditions, in order to increase the credibility of future projections.

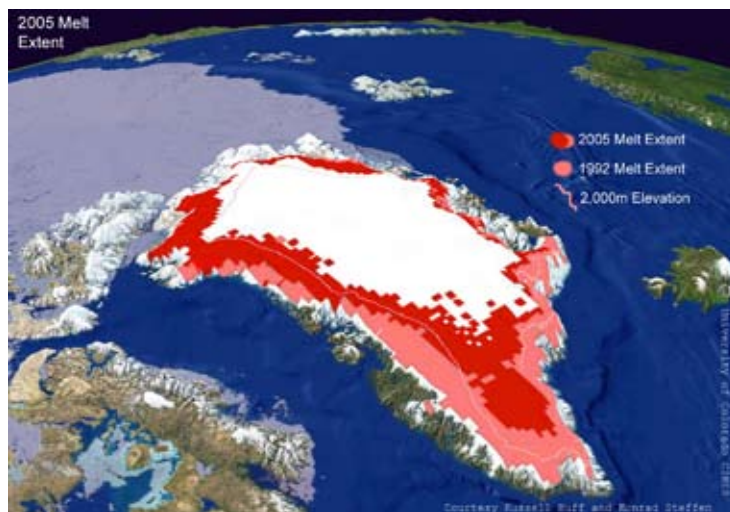
NASA's interest in Earth science and support for Earth-observing satellites requires complex climate models to help interpret remotely sensed data, provide guidance on future missions, and offer frameworks for the detection and attribution of climate changes. Increasing the credibility of NASA models helps in all three of these areas and leads directly to the space agency's scientists being involved in policy advice across multiple agencies at the state and federal levels—including the Environmental Protection Agency, Federal Aviation Administration, National Oceanic and Atmospheric Administration, and Department of Transportation.

The complexity of the models and the physics contained within them has become impossible to quantify without the use of high-end computational facilities. Simulations are increasingly detailed on a geographic level, the number of tracers has increased dramatically, and the length of simulations—now routinely spanning multiple centuries—all put tremendous pressure on existing hardware.

IPCC AR4, Temperature Change (°C)



Future surface air temperatures projected by climate models for the Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report (AR4) are outside the modern observational range. To assess model skill outside the observed range for the last 150 years, modelers must look into past climate, or paleoclimate.



This image shows 1992 versus 2005 Greenland Ice Sheet melt extent. Recent satellite records indicate that ice sheets may decay at a much quicker pace than previously thought. Without long-term records, paleoclimate studies are necessary to predict the future rate of ice sheet decline. (K. Steffen, R. Huff, University of Colorado at Boulder)